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Perspective piece for Resources, Conservation and Recycling

“Circular economy and power relations in global value chains: Tensions and trade-offs for lower income countries”

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1 The concept of the circular economy has gained significant traction among businesses,
2 policymakers and researchers in recent years. The transformation of the current linear
3 economic system to a circular one offers many opportunities to advance sustainable natural
4 resource use, create closed-loop supply chains and implement sustainable recycling
5 management. Circular economy strategies could help lower-income countries 'leapfrog' to a
6 more sustainable development pathway that avoids locking in resource-intensive economic
7 practices of the dominant linear consumption and production system. As lower-income
8 countries' economies are in many ways still more 'circular' in terms of resource management
9 and production and consumption practices than their developed economy counterparts, the
10 question is how to turn this into a development opportunity (Preston and Lehne, 2017).

11 In this Perspective piece, we would like to highlight some concerns and make suggestions
12 about current theoretical and practical approaches to circular economy business models and
13 global value chains (GVCs). We believe these need to be addressed to make the circular
14 economy a success not only for large multinationals at the forefront of innovation, product
15 design and circular business models, but also for small and medium sized suppliers,
16 recycling businesses and other stakeholders in lower income countries. We use the case of
17 digital technologies and issues around electronics value chains and waste management and
18 recycling to illustrate our concerns and highlight tensions and trade-offs associated with
19 GVCs and the circular economy.

20 First, the circular economy needs to provide solutions for the many challenges lower income
21 countries are facing. The current linear growth models based on "take-make-dispose" and
22 the GVCs that support this system will not enable poorer countries to achieve vital human
23 development goals, while remaining within planetary boundaries. In the current approaches,
24 research discourse and practical applications of the circular economy, developing countries
25 are often marginalised. Take, for instance, the case of African countries which are involved
26 in various stages of the global electronics value chains: current knowledge on the circular
27 economy is insufficient to explain the developments in Africa or provide solutions to existing

problems such as conflict metals or hazardous e-waste recycling practices. More knowledge about African recycling and repair models and associated GVCs would inform the conceptual development of the circular economy.

Second, the way GVCs are structured and controlled by powerful actors can make it very difficult to create circular or closed loop value chains. In current GVCs there is much economic activity in lower-income countries revolving around sorting, reusing and recycling waste, including imported electronic waste (see, for example, Imram *et al.* 2017); higher-value, employment-generating opportunities for reuse and remanufacturing are yet to be captured. Current initiatives and research on sustainable supply chains management focusing on technical issues of reverse logistics, retailer take-back schemes or product service systems are overlooking more systemic issues of unequal power relations entrenched in GVCs.

Third, issues of growing inequality are not sufficiently addressed by current circular economy approaches. Powerful countries and transnational corporate actors already control the majority of GVCs and even in a circular system, they are likely to continue to capture the resources and capital they need, exacerbating existing inequalities. This raises questions about how GVCs can be transformed to be consistent with the UN's Sustainable Development Goals and whether closed loop supply chains can reduce inequality and lead to fairer sharing of resources?

Fourth, the current thinking on circular economy is widely based on (a) the continued existence of corporations as we know them and (b) on the continued dominance of dis-integrated production technologies. Both assumptions are increasingly challenged. With new governance systems arising, the "corporation" as we know it turns out to be costly and static compared to emerging self-organizing networks (Mayer, Wright & Phan, 2017). This causes new power constellations, shifting from size and volume to network position and capabilities. The developments in integrated production technologies (e.g. 3D printing) and the increasing

awareness of the real cost of lead time (de Treville et al., 2014) put the current production paradigm driven by economies-of-scale under pressure.

We believe technology and digitalisation affects these issues in contrasting ways. On the one hand, the diffusion of digital technologies may enable us to address the obstacles to the improvement, expansion and replication of circular economy models in new ways and transform resource intensive linear value chains to circular ones. Diffusion of digital technologies may motivate entrepreneurial activity among individuals in lower income countries, facilitating access to resources and relations and supporting new opportunity-based ventures. On the other hand, the diffusion may itself create obstacles and unintended consequences such as mismanaged e-waste, the fastest growing waste stream worldwide. In addition, the wide uptake of digital technologies exacerbates the resource constraints described above: digitalisation is underpinned by a number of critical materials and metals for which recovery and recycling rates need to be significantly increased if they are to achieve their huge development potential. Finally, whilst digital technologies such as robotics and additive manufacturing have considerable potential to disrupt how and where activities are located and organized within GVCs, there are potentially negative impacts on vulnerable actors in the Global South. An example is the application of additive manufacturing (3D printing) in textile value chains through which employment and livelihoods of garment workers in South Asia, particularly women, could be negatively affected. Furthermore, the potential disruptions of GVCs and reduction of international trade volumes through additive manufacturing and integrated production technologies could 'trap' low and middle income countries and contribute further to premature deindustrialisation.

To address these tensions and trade-offs, we call for a transdisciplinary research agenda focusing on the Global South, bringing together interdisciplinary academics and societal stakeholders, industry practitioners, businesses and governmental agencies with influence on broader socio-economic systems and GVCs (Bergendahl *et al.*, 2018). The research agenda should aim to deliver a stronger evidence base to show how the circular economy

81 agenda can deliver opportunities for sustainable GVCs, contribute to the Sustainable
82 Development Goals, and promote sustainable societies as well as addressing environmental
83 degradation and pollution in the Global South.

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